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Support Concept for Creation and Use of Marine Doctrines - Problem Presentation

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Summary

The aim of this research project is the development of an ergonomic support concept for creation and use of marine doctrines.

Command and combat direction systems deal with decision making processes, which support operators in identification, classification and combat. These tasks can be optimised by means of variable parameters according to the situational environment. Special decision rules (*doctrines*) allow the value assignment to parameters according to specific events. Those rules allow the simplification of the operator interface and can influence significantly system behaviour.

The task of this research project is to optimise the tools required for handling and visualising doctrines and parameters rather than to develop doctrines in content. The user shall be relieved by the use of information processing and information presentation technologies. The effectiveness of the doctrine concept shall be assured.

Introduction/problem description

Modern command and combat direction systems (CDS) of marine platforms include decision making processes, which support the operator in identification, classification and combat. These processes regularly are not fixed instead can be optimised by means of variable parameters according to the situational environment, like e.g. threat and geography. Recent developments may help to avoid the manual and single step tuning of such parameters. Special decision rules (called “doctrines” in the CDS F124 (frigate 124)) allow the value assignment to complete parameter sets according to actual needs as determined by the CDS. Events, that trigger such doctrines, are freely definable within all the existing datasets of the system. For example, it is possible to define by means of doctrines that by entry in a defined marine area the combat of Quick Reaction Targets takes place automatically opposed to semi-automatically by exit of the area. Also the commencement of a Rule of Engagement could be a trigger event for a doctrine.

The control of radar systems can take place the same way. New developments, like APAR and SMART-L, include parameters adjustable by doctrines. Those sensors as well as a lot of other parameters influence complex processes. The understanding of the effect of changing parameter values partly requires profound system knowledge. Doctrines allow the simplification of the operator interface, e.g. the algorithms for acquisition, detection and combat of Sea Skimmers could be optimised by manual release of a doctrine “Sea Skimmer Defence” without the need of detailed knowledge by the operator onboard.

Consequently, doctrines can influence significantly system behaviour. Their application will be inevitable for control the multitude and complexity of parameters in order to make the CDS to an efficient field-tested system. It is the aim to condition the CDS that way that the operator is supported and relieved in time critical situations. This requires a thorough planning in definition and selection of doctrines guaranteed only by an ergonomic design of the handling of doctrines.

Problem constraints

A doctrine system will be introduced by the German Navy with the CDS F124 for the first time. The specifications and concepts of this system are the basis for this study. It is not the aim of this study to develop doctrines for F124 in content rather to optimise the tools required for handling and visualising doctrines and parameters. It is assumed that the development of doctrines will be basically performed by a special organisation staff ashore. Its task will be the definition of mission based scenario supported packages of doctrines and their validation by means of a simulation system. The tasks aboard will be the selection of required doctrines as well as a situation dependent adaptation/supplementation.

Necessity and purpose of the research:

It is a big chance for developers and for users to support mission planing as well as mission execution of battle ships by means of doctrines. The CDS F124 will have about 600 parameters and about 5000 situational data at its disposal,

which could be used as building blocks for doctrines. The amount of producible and useful doctrines is practically unlimited and is solely dependent by the system resources. Furthermore, any doctrine might trigger any other doctrine. The variety of combinatorial options as well as the knowledge and the understanding of these complex correlations picture a problem for developers of doctrines and for users onboard.

Beside the use of a doctrine-database filled by the navy there shall be an option to input and edit own doctrines as well as to change parameters onboard. That might yield to problems in consistency and conflicts that have to be avoided absolutely. As far as specified there will be no intelligence in the doctrine editor F124 for proof of consistency. So far, products developed in the scope of the CDS F124 often show the insufficiency that the requirements regarding an ergonomic user interface (clarity, transparency, short operating sequences) remained unconsidered.

Reasons are among others missing knowledge of tactical operational backgrounds, development of system components that belong together under various contracts and time pressure in product development in order to hold the deadlines. It has always been required to bring in tactical-operational knowledge by navy developers in order to produce an application-suited design of the human-machine interface. The doctrine concept F124 is a novel planning instrument with no experience neither in industry nor in the navy.

Task contents

Aim of the research project is the development of an ergonomic support concept for creation and use of marine doctrines. The user shall be relieved by the use of information processing and information presentation technologies and the effectiveness of the doctrine concept shall be assured.

The problem areas to be covered in this project are:

- Creation of doctrines (overview and access to doctrine modules, edit functions)
- Management of doctrines (doctrine database, sorting functions, search functions, select functions,

transparency, i.e. “How can the user recognise the impact of a defined doctrine?”)

- Doctrine handling in use (adaptation of predefined doctrines to a tactical situation, status overview, manual triggers, general application concept: selection of many alternative doctrines or creation of derivatives of a generic structure?)
- Conflict between doctrine controlled and manual parameter setting (avoidance of contradictory actions)
- Consistency of active doctrines (avoidance of contradictory actions)

Task schedule:

- 1) In cooperation with the navy exemplary doctrines shall be selected or formulated, effective in areas like sensor control, identification, classification and combat. The examples ought to cover the complete spectrum of doctrine application, i.e. beside the setting of parameter values the following doctrine actions/triggers are to be considered: “Operator Notification”, “Doctrine Activation”, “Operator Input” and “Time”.
- 2) On the basis of this representative cross-section a support concept for the work with doctrines shall developed, that serves doctrine developers as well as users. Possible weaknesses of the doctrine concept F124 as well as arrangements for their elimination ought to be presented.
- 3) Realisation proposals are to be designed by means of a prototyping tool and exemplary demonstrated.

References:

Task description for the study: “Support concept for creation and use of doctrines”, F, M III, BMVg. (Navy Forces Staff, department III, German Department of Defence)

Discussion – Paper 6

- Support concept for creation and use of marine doctrines
- How do we structure the rules in order to have the right information available at the right time?
- Several thousand rules (marine doctrines) determine the tasks of the staff of a military ship has to perform.
- Knowledge acquisition
- Coding, editing, inserting structuring and visualizing the rules and inference results
- Artificial intelligence
- Visualisation of rules, actions, missions, relations between rules

Discussion:

Major facets of discovery

How to construct, hypothesis generation

The faster you do that, the more alternatives you can obtain

How do you use old rules to create new rules?

Stress factor kicks in when you're running out of time and the user doesn't want to introduce or consider a new alternative.